

# Using Soliton Emitters to Corrupt Cesium-Decay-Based Atomic Timekeeping in Orbital Platforms

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## Introduction

Soliton waves are truly turning out to be the tool of a thousand uses, with applications including disabling ion drives, surface penetrating radar, aircraft detection, transmission of signals through Faraday meshes for eavesdropping and deliberately exfiltrating data from secure environments and even preventing highly focused electromagnetism from scattering over great distances.

## Abstract

GPS satellites, shielded against EM as robustly as possible (while still needing to be able to accept EM associated with ping signals) are unfazed by bombardment by moderate solar flares and conventional emitted EM. When GPS is being jammed, it becomes clear that jamming is occurring to monitors on the ground and this opens up the possibility of the use of countermeasures. Users of the GPS system would then turn to other modes of navigation/weapons guidance if jamming were to persist.

What if, rather than having as the objective keeping the satellite from sending and receiving all signals (there are already plenty of ways of doing this,) the object were to trick the satellite into feeding false information to users throughout the area of coverage? This approach would have the benefit of making a victim believe their system was functioning nominally for an extended period during which GPS-guided munitions would miss consistently by just enough to put the blasts outside of the intended kill zone, alerting the victims to the attack while sparing them from damage.

GPS, generally based upon at least 4 satellites providing femtosecond-accurate latency data back to ground units, is vulnerable to what may be termed a Soliton Decay Delay Attack. A primitive SDDA attack would involve targeting a single satellite for clock deceleration.

How does it work? Soliton waves are flat waves in which electrons that alternately spin in 180-degree opposition all have planes of influence that point at the center of that wave. If it were a pizza, each slice of the pizza would be exerting magnetic force toward the precise center of the pizza, half of them "head over heels" and the other half "heels over head" alternately. The result is not only a wave in which all electrons have no "spin pauses" as conventional EM does and no property of frequency or phase, but any non-soliton EM close to the center would enjoy the benefit of continuing angular confinement within that relatively strong magnetic field.

This means, ultimately, that solitons can deliver meaningful magnetic energy into equipment like atomic clocks even if they are shielded.

Atomic clocks keep time by measuring the number of decay events in cesium atoms. Radioactive decay happens predictably because the probability of a decay event is linked directly to the probability of electrons in the electron cloud of that atom aligning in different "shells" one over top of the other. Aligned electrons exert exponentially more Coulomb Attraction against protons and ultimately "pluck" those protons from nuclei. That is what is really going on when we talk about decay.

Under extreme conditions of magnetism (well beyond what a soliton wave could exert) electrons can be pushed into higher energy states approaching the so-called Extreme Quantum Limit. In this state, decay happens at a remarkably accelerated pace. The level of magnetism required to do this would be essentially impossible to generate. It may, however, be possible to use modest amounts of properly configured magnetism to change the probability of any given decay of cesium. Even on femtosecond scales, EM of this nature emitted from ground level would not accelerate decay enough to throw off GPS outputs by making a clock run fast. In fact, it wouldn't accelerate it at all. It would, however, make the clock run more slowly.

Although magnetism is being added, soliton EM has many important differences from ordinary EM. As each individual wave is transient in nature (although waves may be emitted at varying intervals,) force is exerted at one particular angle relative to whatever is being influenced (in this case, a cesium atom.) As all of the magnetism passing through the cesium atom is likely to all come from the same "pizza slice" (picture a pizza being thrown at a spike, flat side first.) When this interaction occurs, the electrons around the cesium nucleus change their spin orientation (haphazard prior to this) to be consistent with the soliton wave segment in which it finds itself.

The decay of cesium and all isotopic elements is considered highly predictable because under ordinary circumstances, these elements are not exposed to transient waves of artificial EM that interfere with the clockwork-like process. When we add the ingredient of aligned magnetic fields, we can push backward the gears of that clock and make the cesium atom behave as though a decay only recently (in relative terms) occurred, causing the next decay event to come at a later time than it ordinarily would.

Magnetic repulsion in a cesium atom between individual electrons tends to always either preclude or force a decay event, although preclusion is the usual effect. If the magnetic planes of influence of each electron in the cloud work themselves like a Rubik's Cube into a pattern in which all planes complement one another and none of those planes are oriented toward the nucleus, vertical integration of electrons in different shells becomes more likely and an instance of extreme Coulomb Attraction can transpire.

To visualize the decay-associated spin state, picture a ball with flat, round pieces of cardboard stuck to the surface. The flat pieces of cardboard representing the planes of influence, of course, and the ball representing the nucleus. In reality, of course, the electrons are not touching the nucleus and the nucleus is not nearly as large.

So imagine then, that you have a cesium atom in which conditions are almost ripe for a decay event. Along comes a soliton wave all of the sudden, causing our nice, almost-completed Rubik's Puzzle to be undone. Suddenly, the electron spins (which govern the magnetic planes of influence) all start pointing the same way. The cesium atom's natural process of decay is therefore reset without its having endured a decay event. If this cesium atom is part of a GPS satellite, that satellite's clock is now running slow. One soliton pulse will roll back an atomic clock by one "tick." The number of pulses would dictate the extent of the time change.

## **Conclusion**

In a sophisticated attack, multiple satellites can be hit with randomly varied numbers of pulses to prevent anyone from easily compensating for the error. Space-based soliton emitters could be used to corrupt timekeeping at ground-based atomic clocks in order to completely and permanently corrupt all GPS constellations' timekeeping systems by depriving operators of any uncorrupted point of reference. As this is an unknown attack, it would likely be attributed to jamming and would require a great deal of time and effort to resolve.